

Soil Release: Oily Stain Release Method

Developed in 1969 by AATCC Committee RA56; reaffirmed 1970, 1974, 1977; editorially revised 1978, 1983, 1986, 1997, 2004, 2005; revised 1981, 1990, 1995; editorially revised and reaffirmed 2000.

1. Purpose and Scope

1.1 This test method is designed to measure the ability of fabrics to release oily stains during home laundering.

1.2 This test method is primarily for use by fabric finishers to evaluate the likely performance of soil release finishes in actual use (see 12.1). If this test method is used as part of a contract between buyer and seller, or in any case where comparisons between laboratories are being made, the parties should agree to use the same ballast and detergent. In referee situations, or where standard specifications are involved, 1993 AATCC Standard Reference Detergent should be used (see 12.7).

1.3 The use of this test on garments is not precluded.

2. Principle

2.1 A stain is applied to a test specimen. An amount of the staining substance is forced into the fabric by using a specified weight. The stained fabric is then laundered in a prescribed manner and the residual stain rated on a scale from 5 to 1 by comparison with a stain release replica showing a graduated series of stains.

3. Terminology

3.1 **soil**, n.—dirt, oil or other substances not normally intended to be present on a substrate such as a textile material.

3.2 **soil release**, n.—the degree to which a soiled substrate approaches its original, unsoiled appearance as a result of a care procedure.

3.3 **stain**, n.—a local deposit of soil or discoloration on a substrate that exhibits some degree of resistance to removal, as by laundering or drycleaning.

4. Safety Precautions

NOTE: These safety precautions are for information purposes only. The precautions are ancillary to the testing procedures and are not intended to be all inclusive. It is the user's responsibility to use

safe and proper techniques in handling materials in this test method. Manufacturers MUST be consulted for specific details such as material safety data sheets and other manufacturer's recommendations. All OSHA standards and rules must also be consulted and followed.

4.1 Good laboratory practices should be followed. Wear safety glasses in all laboratory areas.

4.2 The 1993 AATCC Standard Reference Detergent may cause irritation. Care should be taken to prevent exposure to skin and eyes.

4.3 Manufacturer's safety recommendations should be followed when operating laboratory testing equipment.

5. Apparatus and Materials (see 12.1)

5.1 AATCC White Textile Blotting Paper (see 12.2).

5.2 Corn oil (see 11.1 and 12.3).

5.3 Glassine paper or equivalent (see 12.4).

5.4 Timer.

5.5 Weight, cylinder 6.4 cm (2.5 in.) diam., 2.268 ± 0.045 kg (5.0 ± 0.1 lb) (stainless steel is preferable).

5.6 Amber bottle with medicine dropper (see 12.5).

5.7 Washer, automatic (see 12.6).

5.8 Dryer, automatic (see 12.6).

5.9 Granular commercial detergent, home wash or 1993 AATCC Standard Reference Detergent (see 1.2 and 12.7).

5.10 Ballast of $92 \times 92 \pm 3$ cm ($36 \times 36 \pm 1$ in.) hemmed pieces of bleached cotton sheeting (Ballast wash load Type 1) or 50/50 polyester/cotton bleached mercerized plain weave (Ballast wash load Type 3) (see 12.8).

5.11 Lighting and evaluation area (see 12.9).

5.12 Table with non-glare black top 61×92 cm (24×36 in.); 89 ± 3 cm (35 ± 1 in.) high.

5.13 Stain Release Replica or 3M Stain Release Rating Scale (see 12.10).

5.14 Thermometer (see 12.11).

5.15 Balance or scale appropriate for the weights required.

6. Test Specimens

6.1 Use two test specimens $38 \times 38 \pm 1$ cm ($15.0 \times 15.0 \pm 0.4$ in.) for each determination. Condition the test specimens for a minimum of 4 h at $21 \pm 1^\circ\text{C}$ ($70 \pm 2^\circ\text{F}$) and $65 \pm 2\%$ RH prior to application of stains.

7. Staining Procedure

7.1 Place the unstained specimen flat on a single thickness of AATCC White Textile Blotting Paper on a smooth, horizontal surface.

7.2 Using the medicine dropper, place 5 drops (approx. 0.2 mL) of corn oil (see 12.3) in the approximate center of the test specimen.

7.3 Place a 7.6×7.6 cm (3.0×3.0 in.) square of glassine paper over the stained area.

7.4 Place the weight (see 5.5) on the glassine paper directly over the stained area.

7.5 Allow weight to sit undisturbed for 60 ± 5 s. Then remove the weight and discard the glassine sheet.

7.6 Do not allow stained test specimens to contact each other in a manner which would transfer stains. Wash within 20 ± 5 min after staining.

8. Washing Procedure

8.1 Fill washer to high water level with water at one of the temperatures from Table I. Check with the thermometer.

8.2 Add 100 ± 1 g of detergent to the washer.

8.3 Start the water agitating, place ballast and then test specimens in the washer making a total load of 1.80 ± 0.07 kg (4.00 ± 0.15 lb). The maximum number of test specimens per washer load shall be 30 with one stain per specimen.

8.4 Set the dial on the washer for a Normal wash to run for 12 min measured time and allow cycle to run to completion. (This gives normal agitation in both the wash and the rinse.)

8.5 At the end of the final spin cycle, place the entire load, test specimens and ballast, into the dryer.

8.6 Dry at *Normal (Cotton Sturdy)* setting at a time setting of 45 min or until dry. On some dryers a 5 min cooldown automatically follows the drying on the *Normal (Cotton Sturdy)* setting. For dryers without this feature dry at High setting for 45 ± 5 min and change setting to Air and run for 5 min. Maximum dryer stack temperature at the cabinet exit

Table I—Washing Temperature Selection

Washing Procedure	Temperature
II	$27 \pm 3^\circ\text{C}$ ($80 \pm 5^\circ\text{F}$)
III	$41 \pm 3^\circ\text{C}$ ($105 \pm 5^\circ\text{F}$)
IV	$49 \pm 3^\circ\text{C}$ ($120 \pm 5^\circ\text{F}$)
V	$60 \pm 3^\circ\text{C}$ ($140 \pm 5^\circ\text{F}$)

should be $65 \pm 6^\circ\text{C}$ ($150 \pm 10^\circ\text{F}$) with the heating element on.

8.7 Remove specimens from dryer immediately on completion of the cycle and lay flat to prevent formation of wrinkles or creases which can affect the stain release rating. Rate residual stains within 4 h after drying.

9. Evaluation

9.1 Mount the stain release replica on the mounting board, with the center of the standard 114 ± 3 cm (45 ± 1 in.) from the floor.

9.2 Place the test specimen flat with face up in the center of the non-glare black topped table with one edge of the table touching the mounting board. The fabric shall be rotated to be viewed from the direction which produces the lowest rating.

9.3 Viewing distance shall be 76 ± 3 cm (30 ± 1 in.) from the back mounting board, with the eye at 157 ± 15 cm (62 ± 6 in.) from the floor. The rater should stand directly in front of the specimen. Varying the viewing angle either horizontally or vertically can affect grades obtained on some fabrics.

9.4 Each rater shall independently compare the residual stain on the test specimen with the stains on the stain release replica and rate each test specimen to the nearest 0.5 grade according to Table II.

10. Report

10.1 Calculate the average of 4 grades for each fabric, (2 judgments on each of 2 specimens), to nearest 0.1. This is the unit of measure for this test method.

10.2 Report whether the Stain Release Replica or the 3M Stain Release Rating Scale was used.

10.3 Report the washing procedure used by appropriate Roman numeral from Table I.

10.4 If stain(s) other than the corn oil are used, identify each stain and report the stain release grade obtained for each stain separately.

10.5 Report water hardness of the washing procedure in terms of parts per million (ppm).

10.6 Report the type ballast material used.

10.7 Report the detergent used and the phosphorus content of the detergent as indicated on the container (see 12.7).

10.8 Report manufacturer and model number of the washer and dryer.

11. Precision and Bias

11.1 *Summary*: An interlaboratory test was carried out in the summer of 1987 to establish the precision of this test method. One operator at each of 5 laboratories tested 2 specimens of each of 5 fabrics each day for 3 days using 1 washer and 1 dryer. Tide (see 12.7) detergent containing 9.8% phosphorus was used because it was the most widely used detergent available. The reference vegetable oil used was Mazola brand corn oil (see 12.3) because it was widely available and consistent in color and quality. Two raters independently evaluated the specimens using the Stain Release Replica and the 3M Stain Release Rating Scale. The unit of measure was the average of the 2 grades for the 2 specimens tested each day. The fabrics were limited to polyester and polyester/cotton materials, most having soil release finishes.

11.2 The components of variance as standard deviations of stain release grades were calculated to be as follows:

	Stain Release Replica	3M Stain Release Rating Scale
Single operator/washer	0.30	0.44
Between laboratories	0.23	0.37

11.3 *Critical Differences*. For the components of variance in 11.2, two averages of observed values should be considered significantly different at the 95% probability level if the difference equals or exceeds the critical differences shown in Table III.

11.4 *Bias*. The true value of the oily stain release grade can only be defined in terms of this test method. Within this limitation, this test method has no known bias.

11.5 A subsequent study by the AATCC Laboratory indicated a statistical difference at the 95% probability level between the new 1993 AATCC Standard Reference Detergent and the AATCC

Standard Reference Detergent 124. An interlaboratory study will be conducted to confirm this difference and establish the precision of this test method with the new ballast Type 3 in the comparative study (see 12.1).

12. Notes

12.1 The 1995 revision of this method reflects the change in formulation of the reference detergent and provides an additional choice of ballast in order to more nearly evaluate the performance of soil release finishes under conditions of actual use. Corn oil has been retained as the reference oily stain. Preliminary comparative studies with the new reference detergent and new ballast Type 3 were conducted by the AATCC Laboratory. No statistical difference at the 95% probability level was observed for the new ballast Type 3. However, these early results indicate a statistical difference between the new 1993 AATCC Standard Reference Detergent and the previous AATCC Standard Reference Detergent 124, the new detergent tending to be less efficient toward oily stain release removal. An interlaboratory study will be conducted in 1995-1996 to confirm this difference and determine the precision of this test method with the new reference detergent.

12.2 AATCC White Textile Blotting Paper is available from AATCC, P.O. Box 12215, Research Triangle Park NC 27709; tel: 919/549-8141; fax: 919/549-8933; e-mail: orders@aatcc.org.

12.3 Mazola, a trademark of Best Foods, CPC International Inc., General Offices, Englewood Cliffs NJ 07632, is a pure corn oil and is widely available. Each bottle has an expiration date printed on the label. It should not be used after that date.

12.4 Rhineland "Blu-White" window envelop glassine — 61×91 cm — 25#/500. Packages of glassine paper containing a roll 46 m long by 30 cm wide (150×1 ft) are available from AATCC, P.O. Box 12215, Research Triangle Park NC 27709; tel: 919/549-8141; fax: 919/549-8933; e-mail: orders@aatcc.org.

12.5 The amber bottle is specified to protect the corn oil from degradation.

12.6 Contact AATCC for model number(s) and source(s) of approved washer(s) and dryer(s). Any other washer or dryer which is known to give comparable results can be used.

12.7 Use a detergent available in the local market. This method was developed using Tide detergent, 9.8%P, because it was the most widely used of the detergents available. Tide

Table II—Stain Release Grades

Grade 5 — Stain equivalent to Standard Stain 5
Grade 4 — Stain equivalent to Standard Stain 4
Grade 3 — Stain equivalent to Standard Stain 3
Grade 2 — Stain equivalent to Standard Stain 2
Grade 1 — Stain equivalent to Standard Stain 1

Grade 5 represents the best stain removal and Grade 1 the poorest stain removal.

Table III—Critical Differences, Grades, for the Conditions Noted^a

(Observation = Unit of Measure = Average of 2 grades for 2 specimens)

No. of Observations	Single Operator/Washer		Between Laboratories	
	Stain Release Replica	3M Stain Release Rating Scale	Stain Release Replica	3M Stain Release Rating Scale
1	0.82	1.20	1.04	1.58
2	0.58	0.85	0.86	1.33
3	0.47	0.70	0.79	1.23

^a The critical differences were calculated using $t = 1.950$, which is based on infinite degrees of freedom.